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NORTHEASTERN FOREST EXPERIMENT STATION

Division of Watershed Management Research

Semi-annual Report

October 1958

GENERAL

The one-armed paper hanger had nothing on the sheer busyness of the Division Staff in Upper Darby during the past six months. He was busy--too busy to get work done. Busyness is probably responsible for as much unanalyzed data as are recorder clocks.

Busily, we can report that:

Dick Sartz and family transferred to Lake States. (Just a year ago we reported that Dick had taken over the Hubbard Brook Project). Sid Weitzman's Lake States program gets a good man, and Bob Pierce, veteran of Vicksburg and long time (4 years) Hubbard Brooker is our new project leader.

In April, Sartz, Reinhart, and Lull visited Coweeta and the Washington Office to inquire into ways and means of analyzing fast-accumulating watershed data. From this came Reinhart's tests with the discharge integrator (the Washington Office has distributed copies of his report), and our current efforts to line up the 7-year - 5-watershed Fernow records for electronic computation.

The cooperative watershed research program is moving along. Baltimore started gaging two watersheds this summer, Newark poured 3 weirs, and State College completed 2 weirs.

Clark Holscher toured our region in September in a functional inspection that included attendance at two watershed meetings and stop-overs at Hubbard Brook, Newark, Baltimore, Kingston, State College, and Elkins.

In May, Lull accompanied Norman Tripp on a watershed management inspection of the Allegheny National Forest. One of the questions, for research was: Why does the pH of a stream in a recently cutover watershed suddenly drop during storm discharges? Such pH changes had been highly destructive to a trout hatchery downstream. Also, up for consideration was the effect of the clear-cut power and gas lines that criss-cross the Forest. For that matter, what is the hydrological-effect width of a road? Or its depth?--if you consider rainfall interception by 6-lane traffic.

KINGSTON RESEARCH CENTER

Leading Ridge Watershed

Weirs were begun and completed on Watersheds No. 2 and No. 3 this summer. The Pennsylvania Department of Forests and Waters constructed another all-weather road to the sites and construction proceeded smoothly. The weirs are similar to the one on Watershed No. 1, 90 degree V-notch set in a Trenton cross section. They are low because of the low gradient and low banks. Both weirs are keyed into the shale bedrock. Each of the three experimental watersheds are about 300 acres in area.

Dedication of the project took place on September 12 in a ceremony that highlighted the annual meeting of the Pennsylvania Forestry Association. Representatives of the School of Forestry of the Pennsylvania State University, the Pennsylvania Department of Forests and Waters, and the U. S. Forest Service, agencies cooperating in this project, participated. Dedicatory addresses were made by the Honorable Maurice K. Goddard, Secretary of the Department of Forests and Waters, Dr. Ralph W. Marquis, Director of the Northeastern Forest Experiment Station, and Dr. Eric A. Walker, President, Pennsylvania State University. Herbert C. Storey, Director, Division of Watershed Management Research, U. S. Forest Service, delivered the Association's banquet address.

Beforehand, Reigner participated in a panel describing the project, along with Gene McNamara, and Dick Byrnes. Following the ceremony Byrnes and Reigner conducted a show-me trip around Watershed No. 1.

Streamflow records are now being produced at all three watersheds.

Pocono Experimental Forest

A group of professional dam builders (regular beavers) moved onto the Pocono watershed this summer; apparently they were not satisfied with the amateur job of the weir builders. The beavers have become established in large enough numbers to become nuisances and have resisted the efforts of the local game protector at trapping them out or otherwise discouraging them. This summer's streamflow records are good time clock reports of the beavers' work schedule. Analysis is not contemplated.

A working plan was prepared and approved for a soil survey of the Pocono Experimental Forest this summer. Mapping was to be done with the same intensity and under the same general classification scheme as that used locally for agricultural areas under the national cooperative soil survey. Most of the soils found on the forest have been identified and some mapping of soil boundaries has been done.

Watershed Calibration

Reigner presented a paper Prediction of streamflow for single watershed calibration at the annual meeting of the American Geophysical Union in Washington on May 6. Since then, further refinements have been made in readying the procedures for manuscript presentation.

These recent analyses indicate:

1. Soil moisture has no direct effect on streamflow at Dilldown. It does have an effect on groundwater storage changes, but no additional effect on streamflow.
2. There are consumptive use losses from streamflow during May through November. These are in addition to losses from storage and are probably riparian use losses. But there are no such losses in December through April.
3. Groundwater depletion and recharge proceeds at a different rate in October from that in June through September. This is probably due to reduced transpiration by the predominately deciduous vegetation.

Miscellaneous

John Kalafus, who recently received his Master's degree at Yale, has been assigned to the Dilldown watershed project by the Pennsylvania Department of Forests and Waters. John thus assumes the duties vacated by Gene McNamara who is now District Forester at Stroudsburg.

Irv Reigner addressed the Forestry School convocation at Penn State in April. A week later he addressed Hal Wilm's class in Watershed Management at the New York State College of Forestry of Syracuse.

Reigner and Lull visited the Wild Creek watershed and the reservoirs belonging to the Bethlehem Water Authority. Bud Frantz, formerly the INCODEL forester, is now assistant Executive Secretary of the Authority.

ELKINS RESEARCH CENTER

Treated Watersheds

During the last year our commercial clear-cut and diameter-limit cut watersheds have been logged. We are presently cutting one of the selectively-marked watersheds and before New Year will go into the intensive management watershed. Logging on this last watershed will be handled in a manner prescribed for municipal watersheds. Results to date indicate that where logger's choice roads are used, such as in the clear cutting and diameter limit cutting, water quality suffers. Since the

start of logging, 105 water quality samples were taken on the clearcut watershed with concurrent samples on the control. The following tabulation shows number of samples in each turbidity unit class:

		Turbidity Unit Classes*					
		:	:	:	:	:	:
		: 0 - 9	: 10-15	: 16-99	: 100-999	: 1000-: 1999	: 2000 : and up : Total
		(Number of Samples)					
Clearcut	13	12	28	36	7	9	105
Control	101	4	0	0	0	0	105

*Turbidity scale of the Jackson turbidimeter.

One of these samples from the clearcut watershed had over 50,000 parts of soil per million parts of water by weight.

After start of logging, 23 samples from the diameter-limit and control watersheds were taken with the following results:

		Turbidity Unit Classes					
		:	:	:	:	:	:
		: 0-9	: 10-99	: 100-999	: 1999	: 2000 : and up	: Total
		(Number of Samples)					
Diameter-limit	1	6	9	1	6		23
Control	23	0	0	0	0		23

The dirtiest sample from the diameter-limit watershed measured 48,000 p.p.m. by weight.

A little more than a year has elapsed since start of logging in the clear-cut area. Logging started on May 15, 1957 and was completed on June 15, 1958. The records show:

		Streamflow	
	Predicted*	Measured	Increase
		(Area Inches)	
May - Oct. 1957	2.5	3.8	1.3
Nov. 1957 - April 1958	16.5	17.4	0.9
May 1958	3.0	3.1	0.1
June 1958	1.8	3.1	1.3
July 1958	4.0	5.6	1.6
Total			5.2

*If watershed had not been cut.

These figures are still tentative and must be considered so until additional analysis is done.

Discharge Integrator

Ken Reinhart spent a lot of time working with a discharge integrator (the type used by the U.S.G.S.) and prepared a report as to its possible uses in streamflow computations. We are not able to make much use of an integrator for the bulk of our data represents flows lower than those for which the instrument was designed.

Meetings Attended

Yawney and Phillips attended the meeting of the Northeastern Forest Soils Group at Amherst, Massachusetts.

Reinhart and Phillips attended the annual meeting of the Northeastern Forest Nurserymen held in Parsons. Reinhart participated in a panel on soil moisture. Phillips assisted with exhibits of measuring instruments.

Hart, Yawney, Reinhart and Trimble attended some of the sessions of the annual meeting of the Interstate Commission on the Potomac River Basin at Blackwater Falls, West Virginia.

Miscellaneous

John Phillips has completed the original humus measurements on the watersheds. He has also been busy this summer with soil moisture measurements, but considerably less busy than he would have been if we had not had such an extremely rainy summer. Over 12 inches of water fell on the Fernow Experimental Forest in July and almost 16 inches on the nearby Clover watersheds.

Roads, Trails, Administrative Site

Accessibility into Hubbard Brook is improving by leaps and bounds. The latest section of our main road was completed in August opening up a total of about four miles of all-weather road to the interior of the watershed. A surface coat of crushed rock will be applied this fall to complete this section.

Our newly acquired weasel has opened new horizons in our approach to servicing gages during the winter months. With the assistance of a trail crew and a bulldozer we cleared a weasel trail to the most weather stations. Using the weasel over-snow vehicle considerably reduces travel (snowshoe) time.

Praise Allah! We now have an administrative site! The final transactions have passed--the deal is signed, sealed and delivered. The property we acquired is a 128-acre tract of land adjacent to the experimental watersheds. We plan to develop much needed administrative buildings on part of the land and possibly use other portions for an additional gaged watershed.

Weir and Calibration Flume

Our fourth weir is still on the drawing boards. The engineers in the regional office have relieved us of the chore of getting out bids for our next weir on a contract basis. It is hoped that these bids will be let early next spring. An access road to this weir site was constructed this summer.

In the past we have calibrated our 90-degree and 120-degree sharp-crested weirs by collecting the water flowing over the blade for a given period of time, weighing the water and then converting the weight to a volume measure. By knowing the gage height at the time the water was collected a stage height-discharge relationship can be established. This procedure can be used to determine the discharge rating curve up to approximately 0.4-foot head. At stage heights greater than 0.4 foot the above method becomes impractical because of such large volumes of water. Rather than depend on a theoretical rating curve for stage heights above 0.4 we have constructed calibration flumes in the stream channels immediately below the weirs. All water passing the blade is funneled through an elongated open-top concrete flume. The flume is uniformly one foot square in cross section in the lower portion, and 1.5 x 3 feet in the upper. A pygmy current meter is used to measure the velocity of the water passing through the flume. These flumes should help us determine actual discharge for stage heights between 0.4 foot and 1.5 feet to 2 feet.

Landslides

A cooperative study of landslides has been completed with Duke University. Edward Flaccus, a graduate student in the Botany Department at Duke, made an extremely interesting and worthwhile study of landslides

as a doctoral dissertation. The title of his thesis is: Landslides and their revegetation in the White Mountains of New Hampshire. The thesis will be microfilmed and Ed plans to publish the results in an appropriate journal.

Miscellaneous

April 13-18--Sartz visited the Fernow Experimental Forest, Coweeta Hydrologic Laboratory and the Washington Office in company of Lull and Reinhart in efforts to evaluate the discharge integrator and IBM devices for tabulating and computing runoff.

April 15--Pierce presented a talk to the New Hampshire Natural Resources Council at Concord, New Hampshire on Watershed Management Research in the White Mountains.

August 26-28--Pierce, Leonard and Federer (summer student trainee) attended the Northeastern Forest Soils Conference held in Amherst, Massachusetts.

September 2-3--Pierce and Lull attended a meeting in Amherst, Massachusetts held to determine the feasibility of establishing a forest watershed research program under the auspices of the Massachusetts Water Resources Commission.

September 8-11--Pierce attended the North American Forest Soils Conference in East Lansing, Michigan.

PUBLICATIONS

Municipal watersheds in the Northeast. Howard W. Lull. Jour. Amer. Water Works Assoc. 50: 979-982.

Forest watershed management research in the ridge and valley section of Pennsylvania. Irvin C. Reigner, William R. Byrnes, and E. F. McNamara. Northeastern For. Exp. Sta., 7 pp.

Influence of land use and forest condition on soil freezing and snow depth. Robert S. Pierce, Howard W. Lull, and Herbert C. Storey. Forest Sci. 4: 246-263.

Management problems and opportunities on forested watersheds in the Northeast. Proc. Soc. of Amer. Foresters, 1957 meeting: 30-32. Norman R. Tripp and Howard Lull.

Manuscripts submitted

Poor logging muddies water supplies. Kenneth G. Reinhart and John R. Phillips.

Better water through forest management. Howard W. Lull.